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# ARCTIC SCIENCES LTD



**PHYSICAL  
OCEANOGRAPHY**

**ICE  
PHYSICS**

**REMOTE  
SENSING**

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## A N N O U N C E M E N T

Arctic Sciences Ltd., is pleased to announce the relocation of its recently-opened East Coast office. The office, headquarters for the company's equipment leasing and technical department, will move effective June 25th, 1984 to:

100 Ilsley Avenue  
Unit AA  
Dartmouth, N.S.     B3B 1L3

The telephone number remains unchanged at (902) 465-3871.

Arctic Sciences offers a full range of physical oceanographic services, from equipment maintenance and leasing to program management and data analysis. Descriptions of the particular services the company offers may be found in the accompanying brochures.

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# THE COMPANY

Since incorporation as a Canadian company in 1977, *Arctic Sciences Ltd.* has specialized in measuring and analyzing the physical properties of the ocean. It employs a staff of approximately twenty professional and support personnel based at the company headquarters in Sidney, B.C. To date, its research programs have ranged from localized measurement and monitoring projects to large-scale, integrated environmental studies using satellite remote-sensing, ships, aircraft and field camp facilities.

The company's reputation for project management and overall reliability was primarily established in the offshore Arctic regions of Baffin Bay, the Northwest Passage and the Beaufort Sea. *Arctic Sciences'* consistently high rate of instrument and data recovery in these northern waters reflects its staff's meticulous attention to detail and familiarity with the special features and limitations of individual instruments and techniques. Increasingly this expertise is being applied in more temperate waters off the Atlantic and Pacific coasts where most of the company's staff received their early oceanographic training.

*Arctic Sciences'* organization into separate oceanography, remote sensing/ice, computing and technical groups has encouraged the development of individual specializations which are routinely integrated into broader company-wide projects. Elements of a typical *Arctic Sciences* program might include:

- *Automated recording* of current meter, water level and meteorological data.
- *Use of satellites* to: relay automatically recorded data; track free floating and ice-mounted drifting stations; provide imagery for the remote evaluations of water and ice properties and movements.
- *Water property* sampling (conductivity, temperature, depth and chemical sampling).

A modern and efficient computing centre is maintained to assure rapid turn-arounds in data processing and to produce basic and higher-order analytical results and models which are directly applicable to clients' assessment, contingency planning and operational requirements. Assistance in the design and production of environmental impact and technical documents is a company specialty.



Inquiries regarding *Arctic Sciences'* full line of economical, assured quality services in design, management, rentals and oceanographic/ice studies may be directed to:

David Fissel, M.Sc., *Physical Oceanography*  
John Marko, Ph.D., *Remote Sensing & Ice Physics*  
David Lemon, M.Sc., *Computing Services*  
Gary Wilton, Assoc. Deg., *Technical Services*



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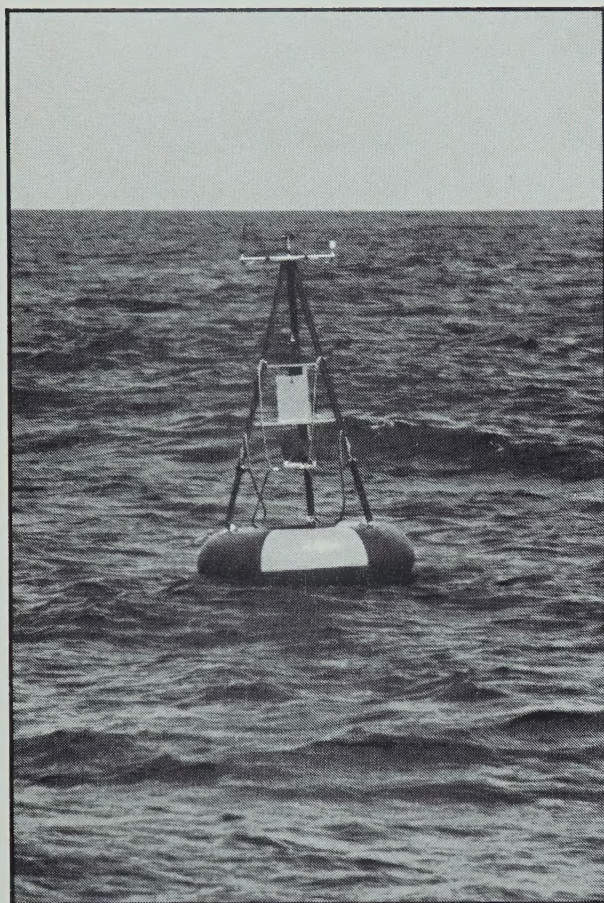




# EQUIPMENT RENTALS

**POLARPAM** Arctic Sciences Ltd. offers rentals of a wide variety of oceanographic and meteorological instrument systems including:

- CTD (Conductivity, Temperature, Depth) profilers.
- Automatic recording current meters designed for operation both in and below the zone of wave influence.
- Acoustic releases and associated control/communication modules.
- Automatic recording weather stations.
- Auxiliary equipment such as buoy flotation, mooring gear, winches, etc.
- Real time telemetry of Ocean currents, tides and waves.



Short and long term leasing is available for state-of-the-art instruments manufactured by Aanderaa, Endeco, Guildline, Mesotech, Novatech, Neil Brown, Datawell and other well known suppliers. Arctic Sciences has added to its inventory the new Neil Brown SMART ACM's and Datawell's Waverider system including the new DIWAR digital receiver, in its continuing commitment to offer the most modern technology available. This service offers Arctic Sciences clients economic and scheduling advantages without the frustrations and costs occasioned by delays in delivery and maintenance requirements.

The company's own record in the recovery of data and equipment reflects the consistency of its servicing and preventive maintenance procedures. Users are assured access to functioning, properly calibrated instruments. Backup inventories of most items are sufficient to allow rapid, short-notice replacement of losses due to various environmental and man-made hazards.

## MAINTENANCE/CALIBRATION

Arctic Sciences equipment inventory is backed up by a maintenance and calibration facility and the expertise gained through equipment operation as well as servicing. A stock of spare parts and battery packs is maintained for all instruments, and service, repair and calibration is carried out on Arctic Sciences' equipment as well as clients' instruments. Recently these services have been expanded to include routine maintenance and calibration of both the Neil Brown ACM and DRCM current meters.

enquires regarding Arctic Sciences full line of specialized instruments, equipment and services may be directed to:

GARY WILTON, MANAGER, ATLANTIC REGION



## ARCTIC SCIENCES LTD

ATLANTIC REGIONAL OFFICE:  
100 Ilsley Avenue, Unit AA, Dartmouth, N.S. B3B 1L3  
Telephone (902) 465-3871

HEAD OFFICE:  
1986 Mills Road, R.R. 2, Sidney, B.C. V8L 3S1  
Telephone (604) 656-0177 Telex 049-7476





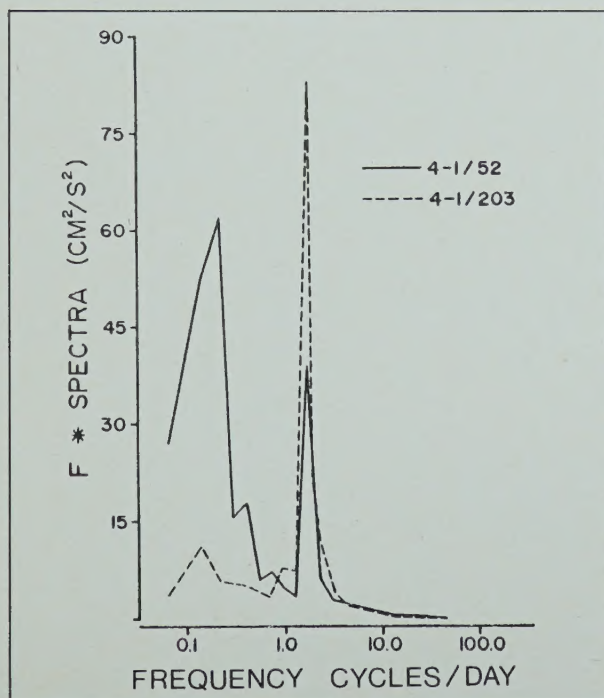


# CURRENT METERS

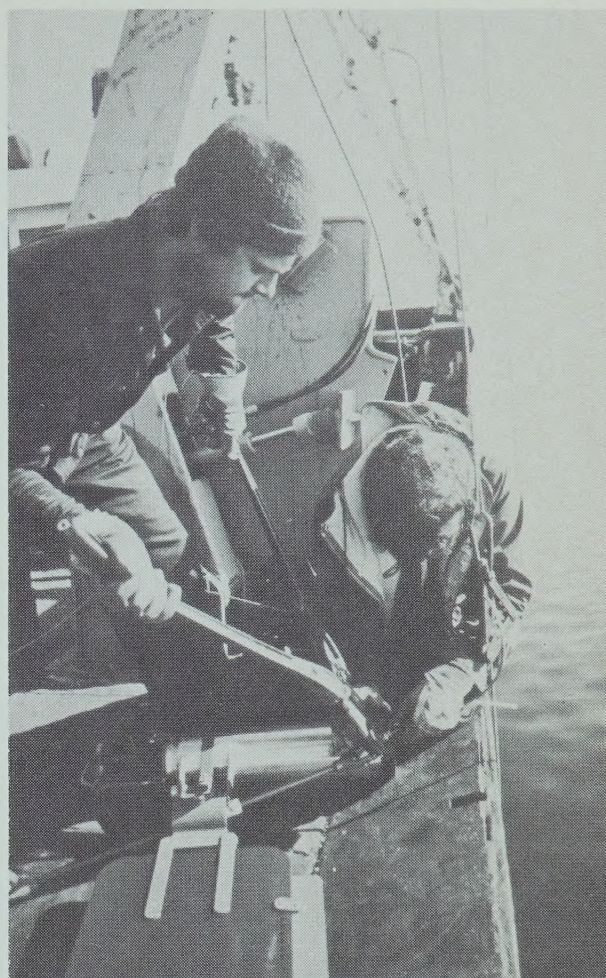
The automatic recording current meter (RCM) is a basic tool of modern oceanography. *Arctic Sciences* has utilized RCM instruments of varying design types (i.e. Aanderaa, Davis-Weller, Endeco and Neil Brown) in its shallow and deep water measurement programs. The high instrument and data recovery rates of these programs, often carried out in the presence of floe ice and icebergs, offer a measure of the design and field expertise of the company's technical and oceanographic groups.

Recent current-meter related projects have included:

- *Modifications of instruments and subsurface mooring designs* to allow deep water current meter measurements in the weak horizontal magnetic fields of the Canadian Arctic
- *Development of instrument-mounting procedures* which minimize surface wave-induced current measurement errors
- *The successful recovery of bottom-mounted instruments* after a year-long deployment in Baffin Bay under a moving ice cover
- A continuing study of *corrosion control technologies*
- Design and successful testing of a *VHF telemetering system* for real-time relay of moored current meter data



An analytical product computed from two current meter data records.



Final preparations for current meter deployment in the Eastern Arctic.

Further development work is also underway in computer-aided mooring design and survival-proofing of instruments and moorings in the presence of floe ice. The recent acquisition of a DEC PDP 11/24 mini-computer has greatly increased the company's capabilities for rapid tape translation and data processing and analysis.

Complete current measurement packages are available including full equipment rental, experimental and logistical planning, deployment and recovery, and all levels of data processing and analysis.

For prices, delivery and other information on these services, please contact: David Fissel, Director, *Oceanography* or Gary Wilton, Director, *Technical Services*.



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# ACOUSTIC OCEANOGRAPHY

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One of the most promising new fields in physical oceanography involves the application of acoustic sensing methods to ocean measurements. For that reason, *Arctic Sciences* is strongly committed to pursuing research and development programs in ocean acoustics, and has created a new section of the company especially for that purpose.

*Arctic Sciences* has recently completed a contract with the Government of Canada which successfully demonstrated the application of acoustic sensing methods to the measurement of wind speed over continental shelf waters. The technique is called WOTAN (for Wind Observation Through Ambient Noise) and was first applied in deep ocean water by scientists at the University of Rhode Island.

WOTAN measurements rest upon the well-established fact that ambient noise in the ocean at frequencies between 2 and 30 KHz is directly proportional to the logarithm of the wind speed over the ocean surface. Thus, by simply measuring the intensity of the subsurface noise at those frequencies and applying the suitable calibration constants, one may measure wind speed from beneath the surface at any depth down to the sea floor. The same data also allow the estimation of rainfall rates at sea.

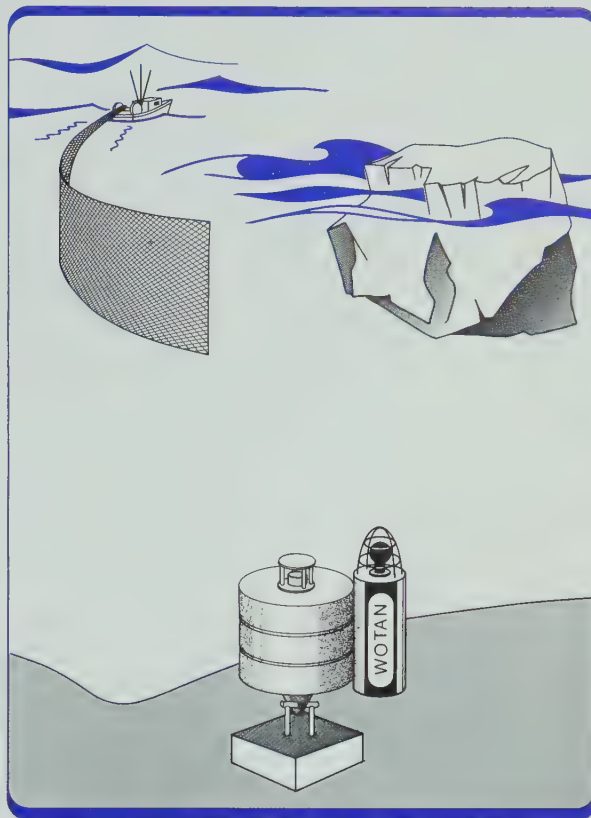
The WOTAN technology allows reliable wind speed records to be collected in remote ocean areas from the safety of the sea floor, essentially eliminating hazards posed by fishing trawlers, icebergs and heavy seas.

WOTAN is presently available as an internally recording instrument which can be deployed for periods of up to 2 years. *Arctic Sciences* offers a full range of WOTAN data processing and interpretation services. The company has also designed a version of the instrument with near-real-time data transmission capacity which incorporates independent direction measurements. We are also investigating acoustical techniques for determining wind direction.

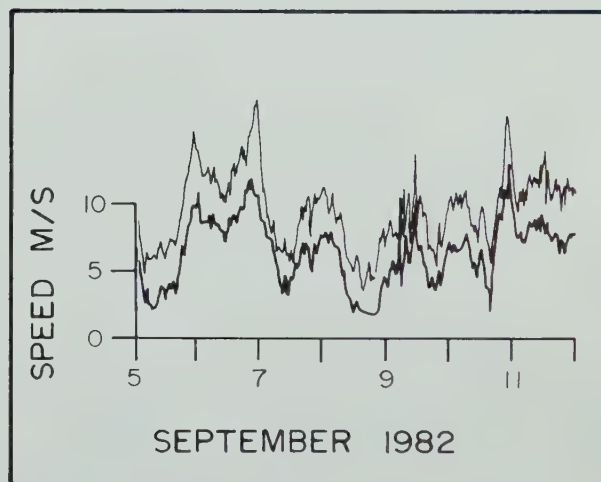
*Arctic Sciences* is currently pursuing other avenues of research in this new and exciting field including, for example, acoustic measurement of directional surface wave spectra.

For further information concerning WOTAN technology, or other applications of acoustic methods to particular oceanographic problems, please contact:

David Lemon, Director, *Acoustic Research*



*Schematic WOTAN deployment.*



*Wind speed recorded by WOTAN (lower trace) and a surface anemometer, (upper trace, shifted upward by 3  $\text{ms}^{-1}$ ).*



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# OIL SPILL MODELLING

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Continuing development of the *Arctic Sciences Ltd.* Oil Spill Model offers new possibilities for assessment and contingency planning applications related to off-shore development.

The basic model has been used previously in many Arctic locations including the Beaufort Sea, Baffin Bay and Lancaster Sound, receiving favourable comments from federal government reviewers. It allows realistic representation of the locations, areal extents and physical properties of discrete parcels or sub-units of the spilled oil in detail commensurate with the available descriptions of relevant oil and environmental parameters. The critical development of site and regionally-specific environmental data inputs is a company specialty based upon *Arctic Sciences'* broad background in marine physical studies.

The flexibility of the model within a simple grid-based input format allows:

- Ease of application to any geographical location.
- The use of a variety of input data as determined by availability and relative importance to time-dependent oil behaviour.
- Modifications of the basic formulation to account for important local circulation features associated with river discharges, shallow water shelf transports, etc.

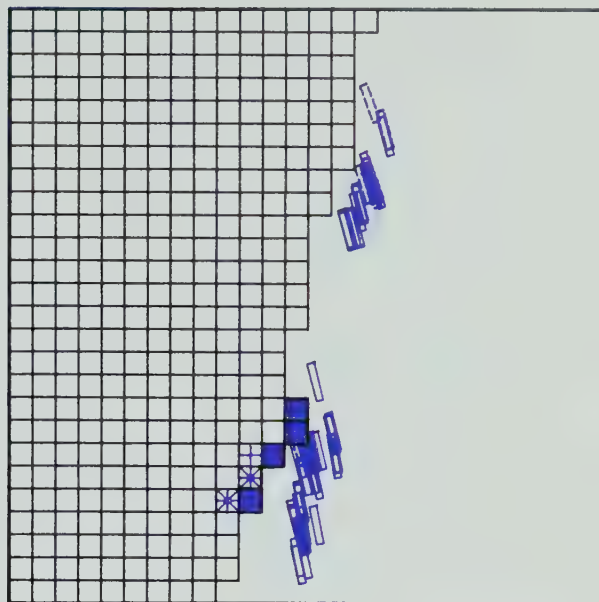
Model results are available in four-colour graphical and representational formats designed to meet individual client requirements. Standard products include:

- Representations of the trajectories, locations, configurations, ages and contents of individual oil parcels.
- Locations, amounts and age distributions of oil on shorelines.
- Oil volumes and fractional surface coverages in delineated biologically critical offshore zones.
- Locations of oil and ice inter-mixtures.

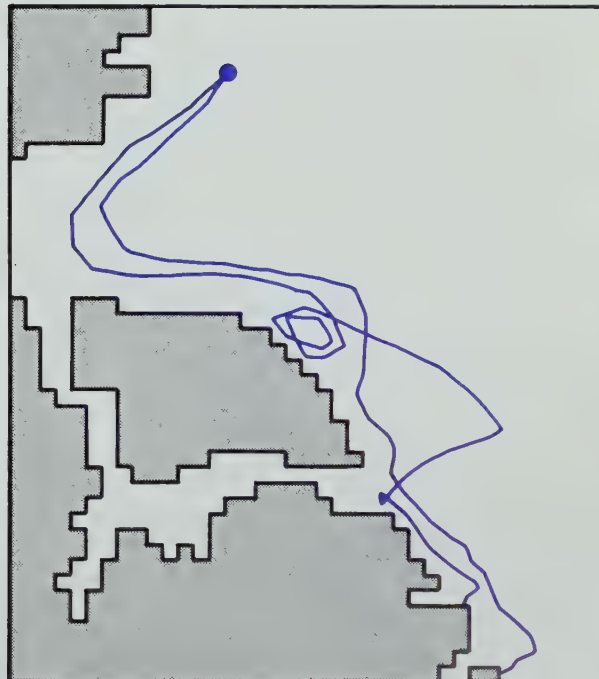
Present model versions suitable for either hindcast or real-time use are mounted on *Arctic Sciences'* DEC PDP-11/24 minicomputer and on a Horizon North Star microcomputer. Ongoing company research and development is directed at further expansion in model applications and improvements in accuracy.

Additional details can be obtained by contacting:

David Fissel, Director, *Oceanography*  
John Marko, Director, *Remote Sensing*



A "snapshot" of the instantaneous locations and approximate boundaries of oil parcels released from a continuous blowout during specific one-day periods. Symbols denote oil concentrations on adjacent shoreline grids. Colour-coding allows representation of oil volumes and ages (relative to dates of release).



Two oil parcel trajectories



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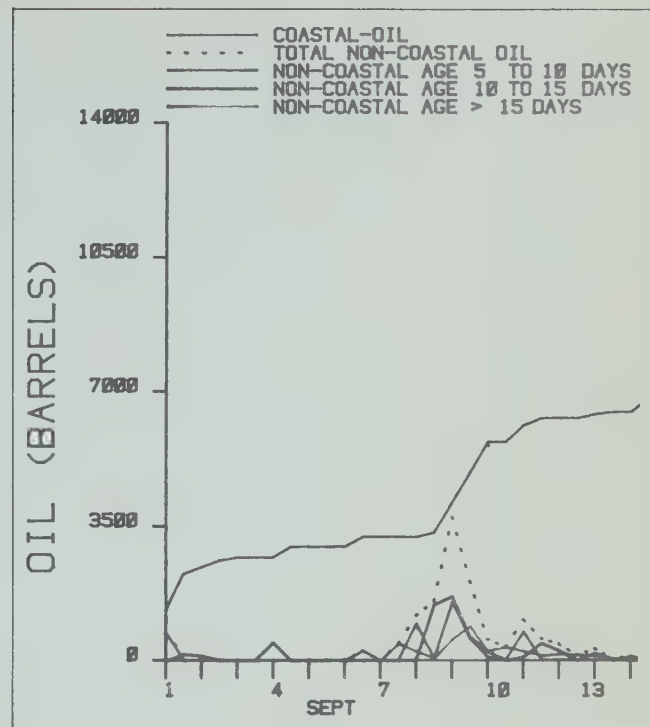
# COMPUTING

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The great volumes of data produced by modern oceanographic and remote-sensing programs are only amenable to analysis and interpretation through the use of efficient and flexible computer systems.

Arctic Sciences' computing centre is designed around a Digital Equipment Corporation PDP-11/24 minicomputer. This machine has 256 kilobytes of internal memory and 20 megabytes of disk storage capacity. It is equipped with a dual density (800/1600 CPI) tape drive, 350 cps line printer, four-pen flat bed plotter and 3 operator terminals. Operating under the multi-user Unix system, the PDP 11/24 accommodates a staff of 4 qualified scientific programmers along with other oceanographic professionals.

Additional computing chores, such as instrument tape translation, are often carried out on a smaller Horizon North Star microcomputer which has its own terminal, 65 kilobyte memory and a set of 3 double density 8" diskettes.



*Oilspill and other oceanographic model outputs are produced in a variety of forms directly applicable to assessment and operational tasks.*

The computing centre offers the following standard services to its clients:

- Aanderaa, Applied Microsystems and Guildline (CTD) data tape translations
- Routine processing, listings and plots of oceanographic and meteorological data
- Statistical products and spectral analyses of time series data
- Design of sub-surface moorings
- Coastline plots of North America in most common projections
- Processing of Tiros/Argos platform data including track plotting, velocity mapping and statistics
- Harmonic analyses
- Processing of digital satellite image data and the production of hard copy "enhanced" imagery
- Oil spill modelling
- Design and implementation of processing, analysis and modelling packages suited to individual client requirements

Further information on specific computing requirements can be provided by: David Lemon, Director, Computing Services.



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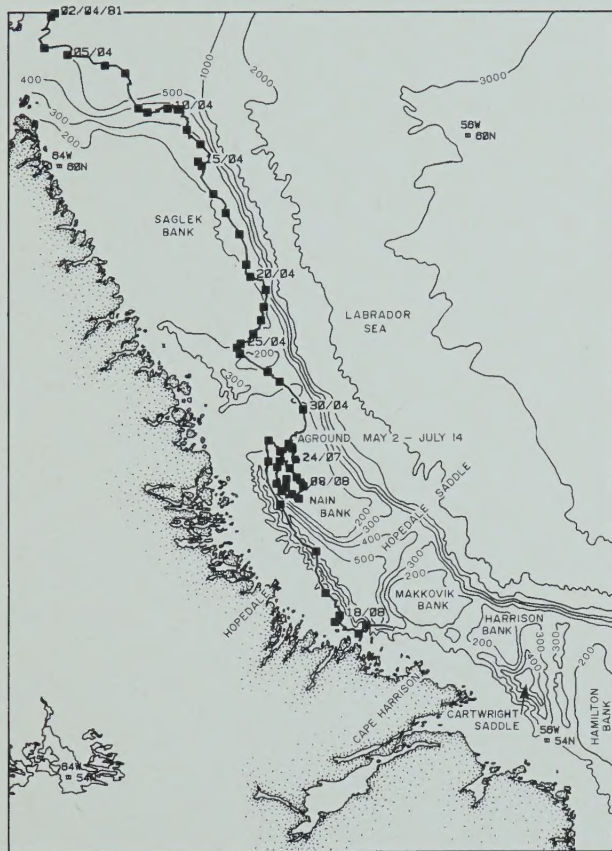
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# REMOTE SENSING

The inherent difficulty of measurement in the marine environment encourages maximum use of remote sensing methods. In this respect, *Arctic Sciences'* research programs have relied extensively upon the use of artificial satellites to provide imagery of the sea surface and a capability for data relay and position tracking of moving data collection platforms. Staff members' experience with satellite-based remote sensing dates back to the 1974 Beaufort Sea Project and has since been applied in almost all marine areas of the Canadian Arctic.



A satellite-recorded iceberg track off the Labrador coast.

Although new applications continue to be found in the field, *Arctic Sciences* remote sensing programs generally fall into one of the following categories:

- **Sea ice study:** Quantitative descriptions of sea ice covers are deduced from current and historical imagery obtained from the Landsat, NOAA and Tiros series of satellites. Typical products include synoptic and statistical velocity representations, identification of patterns of movement, breakup and growth, and the linkage of these data to other environmental factors.

- **Digitally processed imagery:** Satellite imagery in its original digital form is computer-processed to produce pictorial and graphical products which highlight specific details of the distribution of surface-water colour, temperature, and suspended sediment levels.
- **Data collection platform positioning:** Surface currents and ice drifts are measured from the trajectories of radio beacon-equipped buoys, floes and icebergs. The technique has been applied on both small and large scales using ship and aircraft VHF detection methods and the major satellite data collection networks which offer near-real time relay of data from attached sensors.



A Tiros-N satellite image digitally enhanced to display distributions of suspended sediments in the Beaufort Sea.

For further information on *Arctic Sciences'* capabilities in remote sensing, please contact: John Marko, Director, *Remote Sensing*.



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GARY R. WILTON, Assoc. Deg.  
REGIONAL MANAGER,  
ATLANTIC REGION

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LTD**



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UNIT AA  
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